

REMARKS

Claims 1 and 3-14 are now pending in the present application. Claim 2 has been canceled. Claims 1, 3, 4 and 6 have been amended. Claims 13 and 14 are new. Basis for the amendments and new claims can be found throughout the specification, claims and drawings originally filed. The Examiner is respectfully requested to reconsider and withdraw the rejection in view of the amendments and remarks contained herein.

CLAIM OBJECTIONS

The Examiner objected to Claim 4 because of an incorrect spelling of the word "from". Applicants have accordingly amended Claim 4 to replace "form" with "from". Applicants believe this objection is now moot.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sato et al. (U.S. Pat. App. Pub. No. 2003/0058786) in view of Bickford et al. (U.S. Pat. No. 4,083,009) and further in view of Wright (U.S. Pat. No. 5,809,083). This rejection is respectfully traversed.

Referring to Claims 1 and 11, Sato et al. does not show, teach, or suggest means for selecting either a first horizontal polarization antenna or a first vertical polarization antenna based on a determination of a signal level detector, so that data signals for each of a plurality of sub-carriers are transmitted from the selected antenna which is determined to have a higher signal level.

Sato et al. teaches a diversity receiving apparatus for use in an orthogonal frequency division multiplexing (OFDM) system. The diversity receiving apparatus includes a plurality of diversity branches (page 5, paragraph [0055]). Each of the diversity branches includes a receiving antenna and a receiver that frequency-converts RF-band OFDM signals into base-band signals. Transformers transform the base-band signals into frequency spectra utilizing fast Fourier transform (FFT) techniques (page 5, paragraph [0056]). Channel frequency response calculating units calculate channel frequency responses based on the frequency spectra and reference frequency spectra generated by a reference frequency spectrum generator.

Distortion compensators generate distortion-compensated frequency spectra based on the frequency spectra and the channel frequency responses (page 6, paragraph [0058]). The frequency spectra and the distortion-compensated frequency spectra are input to a selector. The selector outputs the distortion-compensated frequency spectra from the diversity branch having the maximum amplitude and/or power (page 6, paragraph [0059]). The selected distortion-compensated frequency spectra are demodulated to generate a digital signal sequence.

The selector does not select between a horizontal polarization antenna and a vertical polarization antenna based on a signal level determination, as required by the claims. The selector selects between distortion-compensated frequency spectra from multiple diversity branches that are identical and that each receive the same OFDM signals. The diversity branches all include identical receiving antennas. For example, one of the receiving antennas is not a vertical polarization antenna while another receiving antenna is a horizontal polarization antenna, as taught by Applicants.

Additionally, Sato et al. is silent with respect to transmitting OFDM signals. Therefore, data signals for each of a plurality of sub-carriers are not transmitted from selected antennas having the highest signal levels, as required by the claims. Sato et al. only disclose a diversity receiving apparatus including multiple diversity branches that all receive identical OFDM signals.

Bickford et al. does not remedy the shortcomings of Sato et al. Bickford et al. teaches a diversity communications system in which signals are transmitted and received in both horizontal and vertical antenna polarization. One half of a serial data stream at a transmitting station is transmitted with a horizontal polarization and the other half of the serial data stream is transmitted with a vertical polarization (col. 3, line 39). A receiving station includes two antennas that receive the horizontal polarization signals and two antennas that receive the vertical polarization signals. Diversity receivers choose between the better of the two signals received by the horizontal antennas and the better of the two signals received by the vertical antennas (col. 4, line 32).

The transmitting station does not select either the horizontal antenna or the vertical antenna based on a signal level determination, as required by the claims. As discussed above, the transmitting station transmits half of a serial data stream with a horizontal polarization and half of the serial data stream with a vertical polarization. The serial data stream is not split between horizontal and vertical transmitters based on the signal strengths of the two paths. Each of the horizontal and vertical transmitters always transmit half of the serial data stream. Therefore, the system taught by Bickford et al. is susceptible to a significant amount of delay and/or data loss. For example, if

either of the horizontal or vertical polarization data paths become completely deficient, at least half of the serial data stream is lost.

Wright does not remedy the shortcomings of either Sato et al. or Bickford et al. Wright teaches a differentially encoded pilot word system that allows a receiver to synchronize with a transmitter. The pilot words include at least two pilot signals separated by a fixed distance (Abstract). The receiver monitors differences between symbols to locate the pilot words and in turn become synchronized with the transmitter. After synchronization, the receiver uses pilot symbols in the pilot words to perform channel estimation and compensation (Abstract). The transmitter does not select between a horizontal antenna and a vertical antenna based on a signal level determination for signal transmission.

On page 5, line 3, of the Application, Applicants teach that if signals under the same sub-carrier are sent from multiple antennas the signals interfere with one another. Therefore, Applicants teach monitoring the signal levels of both horizontal and vertical polarization data paths. Data signals for each sub-carrier of an OFDM signal are transmitted from an antenna associated with the data path having the higher signal level at a given time. Therefore, unlike the system taught by Bickford et al., the system taught by Applicants is not required to transmit a minimum number of data signals for a sub-carrier on each of the data paths.

Thus, Applicants believe Claims 1 and 11 patentably distinguish over the art of record. Likewise, Claims 3-5, which depend directly or indirectly from Claim 1, are also believed to be allowable over Sato et al., Bickford et al., and Wright for the same reasons. Reconsideration of the rejection is respectfully requested.

Referring to Claim 6, Sato et al. does not show, teach, or suggest means for dividing data signals to be transmitted for each of a plurality of sub-carrier frequencies into a first data signal group to be transmitted from a horizontal polarization antenna and a second data signal group to be transmitted from a vertical polarization antenna, so that respective data signals are transmitted from either one of both antennas which has a higher performance.

The arguments made above with respect to Claims 1 and 11 are equally applicable to Claim 6. The selector taught by Sato et al. does not select between a horizontal polarization antenna and a vertical polarization antenna based on a signal level determination. The selector selects between distortion-compensated frequency spectra from multiple diversity branches that are identical and that each receive the same OFDM signals. Sato et al. is silent with respect to transmitting OFDM signals. Sato et al. only discloses a diversity receiving apparatus including multiple diversity branches that all receive identical OFDM signals.

Bickford et al. does not remedy the shortcomings of Sato et al. The transmitting station taught by Bickford et al. does not select either the horizontal antenna or the vertical antenna based on a signal level determination. The transmitting station transmits half of a serial data stream with a horizontal polarization and half of the serial data stream with a vertical polarization. Each of the horizontal and vertical transmitters always transmit half of the serial data stream. Therefore, the system taught by Bickford et al. is susceptible to a significant amount of delay and/or data loss.

Wright does not remedy the shortcomings of either Sato et al. or Bickford et al. The transmitter taught by Wright does not select between a horizontal antenna and a vertical antenna based on a signal level determination for signal transmission.

Thus, Applicants believe Claim 6 patentably distinguishes over the art of record. Likewise, Claims 7 and 8, which depend directly from Claim 6, are also believed to be allowable over Sato et al., Bickford et al., and Wright for the same reasons. Reconsideration of the rejection is respectfully requested.

Referring to Claim 9, Sato et al. does not show, teach, or suggest a synthesizer for synthesizing first and second data signals phase-adjusted by first and second phase adjusters.

Sato et al. teaches a diversity receiving apparatus for use in an orthogonal frequency division multiplexing (OFDM) system. The diversity receiving apparatus includes a plurality of diversity branches (page 5, paragraph [0055]). Each of the diversity branches includes a receiving antenna and a receiver that frequency-converts RF-band OFDM signals into base-band signals. Transformers transform the base-band signals into frequency spectra utilizing fast Fourier transform (FFT) techniques (page 5, paragraph [0056]). Channel frequency response calculating units calculate channel frequency responses based on the frequency spectra and reference frequency spectra generated by a reference frequency spectrum generator.

Distortion compensators generate distortion-compensated frequency spectra based on the frequency spectra and the channel frequency responses (page 6, paragraph [0058]). The frequency spectra and the distortion-compensated frequency spectra are input to a selector. The selector outputs the distortion-compensated

frequency spectra from the diversity branch having the maximum amplitude and/or power (page 6, paragraph [0059]). The selected distortion-compensated frequency spectra is demodulated to generate a digital signal sequence.

The selector does not synthesize first and second distortion-compensated frequency spectra, as required by the claims. The selector selects between distortion-compensated frequency spectra from multiple diversity branches that are identical and that each receive the same OFDM signals. However, since the OFDM signals received by each of the diversity branches taught by Sato et al. are identical and are transmitted with the same polarity, a synthesizer is not applicable in order to synthesize data signals that combine to form transmitted OFDM signals.

Bickford et al. does not remedy the shortcomings of Sato et al. Bickford et al. teach a diversity communications system in which signals are transmitted and received in both horizontal and vertical antenna polarization. One half of a serial data stream at a transmitting station is transmitted with a horizontal polarization and the other half of the serial data stream is transmitted with a vertical polarization (col. 3, line 39). A receiving station includes two antennas that receive the horizontal polarization signals and two antennas that receive the vertical polarization signals. Diversity receivers choose between the better of the two signals received by the horizontal antennas and the better of the two signals received by the vertical antennas (col. 4, line 32).

As discussed above, the transmitting station transmits half of a serial data stream with a horizontal polarization and half of the serial data stream with a vertical polarization. Each of the horizontal and vertical transmitters always transmit half of the serial data stream. Therefore, the order and arrangement of transmitted data is fixed

and predetermined and a synthesizer is not applicable in order to properly combine the best horizontal and vertical polarization signals.

Wright does not remedy the shortcomings of either Sato et al. or Bickford et al. Wright teaches a differentially encoded pilot word system that allows a receiver to synchronize with a transmitter. The pilot words include at least two pilot signals separated by a fixed distance (Abstract). The receiver monitors differences between symbols to locate the pilot words and in turn become synchronized with the transmitter. After synchronization, the receiver uses pilot symbols in the pilot words to perform channel estimation and compensation (Abstract). The transmitter does not include a synthesizer that synthesizes data signals from horizontal and vertical antennas.

Thus, Applicants believe Claim 9 patentably distinguishes over the art of record. Reconsideration of the rejection is respectfully requested.

Referring to Claim 10, Sato et al. does not show, teach, or suggest transmitting the same OFDM signals from both of a horizontal polarization antenna and a vertical polarization antenna.

Sato et al. teaches a diversity receiving apparatus for use in an orthogonal frequency division multiplexing (OFDM) system. The diversity receiving apparatus includes a plurality of diversity branches (page 5, paragraph [0055]). Each of the diversity branches includes a receiving antenna and a receiver that frequency-converts RF-band OFDM signals into base-band signals. Transformers transform the base-band signals into frequency spectra utilizing fast Fourier transform (FFT) techniques (page 5, paragraph [0056]). Channel frequency response calculating units calculate channel

frequency responses based on the frequency spectra and reference frequency spectra generated by a reference frequency spectrum generator.

Distortion compensators generate distortion-compensated frequency spectra based on the frequency spectra and the channel frequency responses (page 6, paragraph [0058]). The frequency spectra and the distortion-compensated frequency spectra are input to a selector. The selector outputs the distortion-compensated frequency spectra from the diversity branch having the maximum amplitude and/or power (page 6, paragraph [0059]). The selected distortion-compensated frequency spectra is demodulated to generate a digital signal sequence.

The diversity branches all include identical receiving antennas. For example, one of the receiving antennas is not a vertical polarization antenna while another receiving antenna is a horizontal polarization antenna, as taught by Applicants. Additionally, Sato et al. are silent with respect to transmitting OFDM signals.

Bickford et al. does not remedy the shortcomings of Sato et al. Bickford et al. teach a diversity communications system in which signals are transmitted and received in both horizontal and vertical antenna polarization. One half of a serial data stream at a transmitting station is transmitted with a horizontal polarization and the other half of the serial data stream is transmitted with a vertical polarization (col. 3, line 39). A receiving station includes two antennas that receive the horizontal polarization signals and two antennas that receive the vertical polarization signals. Diversity receivers choose between the better of the two signals received by the horizontal antennas and the better of the two signals received by the vertical antennas (col. 4, line 32).

As discussed above, the transmitting station transmits half of a serial data stream with a horizontal polarization and half of the serial data stream with a vertical polarization. The whole serial data stream is not transmitted by both horizontal and vertical transmitters. Each of the horizontal and vertical transmitters always transmit half of the serial data stream. Therefore, the system taught by Bickford et al. is susceptible to a significant amount of delay and/or data loss. For example, if either of the horizontal or vertical polarization data paths become completely deficient, at least half of the serial data stream is lost.

Wright does not remedy the shortcomings of either Sato et al. or Bickford et al. Wright teaches a differentially encoded pilot word system that allows a receiver to synchronize with a transmitter. The pilot words include at least two pilot signals separated by a fixed distance (Abstract). The receiver monitors differences between symbols to locate the pilot words and in turn become synchronized with the transmitter. After synchronization, the receiver uses pilot symbols in the pilot words to perform channel estimation and compensation (Abstract). The transmitter does not transmit the same signals with both a horizontal and vertical polarization antenna.

Thus, Applicants believe Claim 10 patentably distinguishes over the art of record. Likewise, Claim 13 depends directly from Claim 10 and is also believed to be allowable over Sato et al., Bickford et al., and Wright for the same reasons. Reconsideration of the rejection is respectfully requested.

Referring to Claim 12, Sato et al. does not show, teach, or suggest means for selecting either a first horizontal polarization antenna or a first vertical polarization antenna based on a determination of a signal level detector, so that the data signals for

each of a plurality of sub-carriers are transmitted from the selected antenna which is determined to have a higher signal level.

The arguments made above with respect to Claim 1 are equally applicable to Claim 12. The selector taught by Sato et al. does not select between a horizontal polarization antenna and a vertical polarization antenna based on a signal level determination. Sato et al. is silent with respect to transmitting OFDM signals. Sato et al. only discloses a diversity receiving apparatus including multiple diversity branches that all receive identical OFDM signals.

Bickford et al. does not remedy the shortcomings of Sato et al. The transmitting station taught by Bickford et al. does not select either the horizontal antenna or the vertical antenna based on a signal level determination. The system taught by Bickford et al. is susceptible to a significant amount of delay and/or data loss.

Wright does not remedy the shortcomings of either Sato et al. or Bickford et al. The transmitter taught by Wright does not select between a horizontal antenna and a vertical antenna based on a signal level determination for signal transmission.

Thus, Applicants believe Claim 12 patentably distinguishes over the art of record. Reconsideration of the rejection is respectfully requested.

NEW CLAIMS

Claim 13 is a new dependent claim which depends from Claim 10 and is believed to properly further limit Claim 10. Claim 14 is a new dependent claim which depends from Claim 12 and is believed to properly further limit Claim 12.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Attorneys for Applicants

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By 

Michael J. Schmidt, 34,007

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

MJS/wmt/pmg